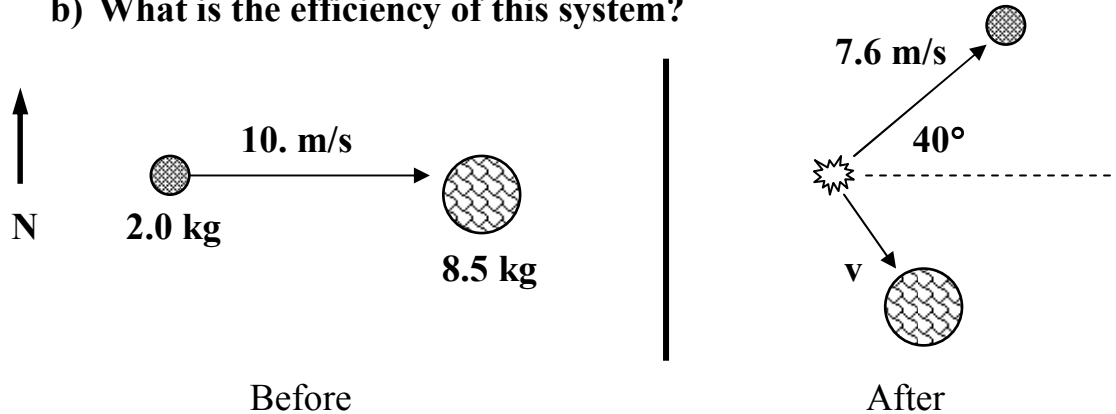


Example #20: A 2.0 kg ball collides at 10. m/s with a much larger stationary 8.5 kg ball as shown to the right. After the collision, the 2.0 kg ball changes its speed to 7.6 m/s @ 40° N of E.

- At what speed 'v' does the 8.5 kg ball move after the collision?
- What is the efficiency of this system?



a) a collision : use cons. of momentum

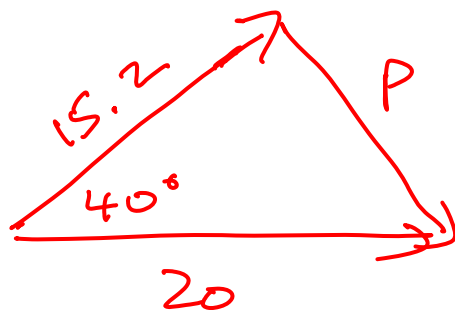
before

$$\overrightarrow{P_T} = 10(2) = 20$$

after

$$\frac{2(7.6) = 15.2}{40^\circ}$$

\downarrow
 P



$$P^2 = 15.2^2 + 20^2 - 2(15.2)(20)\cos 40 \quad P = 12.9 \frac{\text{kg}\cdot\text{m}}{\text{s}}$$

$$P = mv$$

$$12.9 = 8.5v$$

$$\boxed{v = 1.5 \text{ m/s}}$$

b) before: $E_r = E_k$ of 2 kg ball
 $= \frac{1}{2}(2)(10)^2 = 100 \text{ J}$

after: $E_{out} = E_k$ for each ball after collision
 $= \frac{1}{2}(2)(7.6)^2 + \frac{1}{2}(8.5)(1.5)^2$
 $= 67 \text{ J}$

$$Eff = \frac{E_{out}}{E_r} = \frac{67}{100} \times 100$$

$$\boxed{Eff = 67\%}$$